Goal 3: Ensure healthy lives and promote well-being for all at all ages

Target 3.2: By 2030, end preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1,000 live births and under-5 mortality to at least as low as 25 per 1,000 live births

Indicator 3.2.2: Neonatal mortality rate

# Institutional information

## Organization(s):

United Nations Children's Fund (UNICEF)

# Concepts and definitions

## Definition:

The neonatal mortality rate is the probability that a child born in a specific year or period will die during the first 28 completed days of life if subject to age-specific mortality rates of that period, expressed per 1000 live births.

Neonatal deaths (deaths among live births during the first 28 completed days of life) may be subdivided into early neonatal deaths, occurring during the first 7 days of life, and late neonatal deaths, occurring after the 7th day but before the 28th completed day of life.

## Rationale:

Mortality rates among young children are a key output indicator for child health and well-being, and, more broadly, for social and economic development. It is a closely watched public health indicator because it reflects the access of children and communities to basic health interventions such as vaccination, medical treatment of infectious diseases and adequate nutrition.

# Methodology

## Computation method:

The UN Inter-agency Group for Child Mortality Estimation (UN IGME) estimates are derived from nationally representative data from censuses, surveys or vital registration systems. The UN IGME does not use any covariates to derive its estimates. It only applies a curve fitting method to good-quality empirical data to derive trend estimates after data quality assessment. In most cases, the UN IGME estimates are close to the underlying data. The UN IGME aims to minimize the errors for each estimate, harmonize trends over time and produce up-to-date and properly assessed estimates. The UN IGME produces neonatal mortality rate estimates with a Bayesian spline regression model which models the ratio of neonatal mortality rate / (under-five mortality rate - neonatal mortality rate).

Estimates of NMR are obtained by recombining the estimates of the ratio with the UN IGME-estimated under-five mortality rate. See the references for details.

For the underlying data mentioned above, the most frequently used methods are as follows:

- ***Civil registration***: Number of children who died during the first 28 days of life and the number of births used to calculate neonatal mortality rates.
- ***Censuses and surveys***: Censuses and surveys often include questions on household deaths in the last 12 months, which can be used to calculate mortality estimates.
- ***Surveys:*** A direct method is used based on a full birth history, a series of detailed questions on each child a woman has given birth to during her lifetime. Neonatal, post-neonatal, infant, child and under-five mortality estimates can be derived from the full birth history module.

# Treatment of missing values:

- ***At country level:***

UN IGME estimates are based on underlying empirical data. If the empirical data refer to an earlier reference period than the end year of the period the estimates are reported, UN IGME extrapolates the estimates to the common end year. UN IGME does not use any covariates to derive the estimates.

- ***At regional and global levels:***

To construct aggregate estimates of neonatal mortality before 1990, regional averages of mortality rates were used for country-years with missing information and weighted by the respective population in the country-year.

# Regional aggregates:

Global and regional estimates of neonatal mortality rates are derived by aggregating the number of country-specific neonatal deaths estimated by the UN IGME and the country-specific births from the United Nations Population Division, based on a birth-week cohort approach.

# Sources of discrepancies:

The UN IGME estimates are derived based on national data. Countries often use a single source as their official estimates or apply methods different from the UN IGME methods to derive estimates. The differences between the UN IGME estimates and national official estimates are usually not large if empirical data has good quality.

Many countries lack a single source of high-quality data covering the last several decades. Data from different sources require different calculation methods and may suffer from different errors, for example random errors in sample surveys or systematic errors due to misreporting. As a result, different surveys often yield widely different estimates of neonatal mortality for a given time period and available data collected by countries are often inconsistent across sources. It is important to analyse, reconcile and evaluate all data sources simultaneously for each country. Each new survey or data point must be examined in the context of all other sources, including previous data. Data suffer from sampling or non-sampling errors (such as misreporting of age and survivor selection bias; underreporting of child deaths is also common). UN IGME assesses the quality of underlying data sources and adjusts data when necessary. Furthermore, the latest data produced by countries often are not current estimates but refer to an earlier reference period. Thus, the UN IGME also projects estimates to a common reference year. In order to reconcile these differences and take better account of the systematic biases associated with the various types of data inputs, the UN IGME has developed an estimation method to fit a smoothed trend curve to a set of observations and to extrapolate that

trend to a defined time point. The UN IGME aims to minimize the errors for each estimate, harmonize trends over time and produce up-to-date and properly assessed estimates of child mortality. In the absence of error-free data, there will always be uncertainty around data and estimates. To allow for added comparability, the UN IGME generates such estimates with uncertainty bounds. Applying a consistent methodology also allows for comparisons between countries, despite the varied number and types of data sources. UN IGME applies a common methodology across countries and uses original empirical data from each country but does not report figures produced by individual countries using other methods, which would not be comparable to other country estimates.

# Data sources

## Description:

Nationally-representative estimates of child mortality can be derived from a number of different sources, including civil registration and sample surveys. Demographic surveillance sites and hospital data are excluded as they are rarely representative. The preferred source of data is a civil registration system that records births and deaths on a continuous basis. If registration is complete and the system functions efficiently, the resulting estimates will be accurate and timely. However, many countries do not have well-functioning vital registration systems. In such cases household surveys, such as the UNICEF-supported Multiple Indicator Cluster Surveys (MICS), the USAID-supported Demographic and Health Surveys (DHS) and periodic population censuses have become the primary sources of data on under-five and neonatal mortality. These surveys ask women about the survival of their children, and it is these reports that provide the basis of child mortality estimates for a majority of low- and middle- income countries. These data, however, are often subject to sampling or/and non-sampling errors, which might be substantial.

### *Civil registration*

Civil registration data are the preferred data source for under-five, infant and neonatal mortality estimation. The calculation of neonatal mortality rates are derived from the number of neonatal deaths and number of births over a period. For civil registration data (with available data on the number of deaths and mid-year populations), initially annual observations were constructed for all observation years in a country.

### *Population census and household survey data*

The majority of survey data comes from the full birth history (FBH), whereby women are asked for the date of birth of each of their children, whether the child is still alive, and if not the age at death.

## Collection process:

For neonatal mortality, UNICEF and the UN IGME compile data from all available data sources, including household surveys, censuses, vital registration data etc. UNICEF and the UN IGME compile these data whenever they are available publicly and then conduct data quality assessment. UNICEF also collects data through UNICEF country offices by reaching national counterpart(s). The UN IGME also collects vital registration data reported by Ministries of Health or other relevant agencies to WHO.

Adjustments of empirical data are made in high prevalence HIV settings to adjust for under reporting of child mortality due to missing mothers in survey data. UN IGME than applies a curve fitting method to these empirical data to derive the UN IGME trend estimates of the neonatal mortality rates.

Because deaths by crisis are difficult to capture in household survey or census data, UN IGME adjusts the neonatal mortality estimates for crisis mortality.

Then the UN IGME conducts an annual country consultation by sending the UN IGME estimates, empirical data used to derive the UN IGME estimates, and notes on methodology to National Statistical Offices, and to Ministries of Health or relevant agencies for feedback on the UN IGME estimates and the empirical data. National Statistical Offices, Ministries of Health or relevant agencies review the UN IGME estimates and empirical data, send feedback or comments, and sometimes supply additional empirical data.

To increase the transparency of the estimation process, the UN IGME has developed a child mortality web portal: CME (www.childmortality.org). It includes all available data and shows estimates for each country. Once the new estimates are finalized, CME will be updated to reflect all available data and the new estimates.

# Data availability

## Description:

Indicator is available for all countries from 1990 (or earlier) to 2018, depending on availability of empirical data for each country before 1990.

## Disaggregation:

The common disaggregation for mortality indicators includes disaggregation by sex, age (neonatal, infant, child), wealth quintile, residence, and mother’s education. Disaggregated data are not always available. Disaggregation by geographic location is usually at the regional level, or the minimum provincial level for survey or census data. Data from well-functioning vital registration systems can provide further geographical breakdowns.

# Calendar

## Data collection:

The UN IGME underlying database is continuously updated whenever new empirical data become available.

## Data release:

A new round of estimates of the UN IGME will be released in 2020; usually, the release date is in the month of September.

# Data providers

National Statistical Office or the Ministry of Health are mostly involved in generating neonatal mortality data at the national level.

# Data compilers

UNICEF

# References

## URL:

http://childmortality.org

https://data.unicef.org/topic/child-survival/neonatal-mortality/

## References:

United Nations Inter-agency Group for Child Mortality Estimation (UN IGME). Levels & trends in child mortality. Report 2019. New York: UNICEF, 2019. Available at https://childmortality.org/wp-content/uploads/2019/09/UN-IGME-Child-Mortality-Report-2019.pdf

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# Related indicators as of February 2020

3.2.1: Under-five mortality rate